

Appendix C

South Fork Skykomish River Mean Discharge Ranking in Summer

MEMORANDUM



TO: Halah Voges, Steve Howard, Mike Byers **DATE:** 10 January 2006
FROM: Joe Scott **RE:** South Fork Skykomish River Mean
Discharge Ranking in Summer

There is a need to know the summer stages of the South Fork of the Skykomish River to determine if construction of levee remediation can proceed safely in the summer of 2006 and how high the crest of the cofferdam needs to be to prevent overtopping during construction. River stages of the South Fork of the Skykomish River are measured by a sonic gage on the 5th Street Bridge. Mean monthly stage statistics are available for the years 2000 through 2004 (see Table 1), a total of only 5 years. Do these stages represent the typical range of river stages?

Mean monthly discharges of the South Fork of the Skykomish River at Gold Bar are available for the years 1929 through 2004, or 76 years. To address the above question, the 2000-2004 discharges of the South Fork of the Skykomish River at Gold Bar for June through September are compared to the 1929-2004 record to determine the summer normalcy of the last 5 years.

The mean monthly discharges for June through September for 1929-2004 are graphed and listed separately from the rest of the record (see Attachment A). For each of these months individually, the discharges are ordered in ascending order. The place in the order for the last five years is then noted on the listing.

The results indicate that the last five years are scattered in the record comparison over 76 years; but in general, three of the years are always near the low end of record and two years are always near the high end. For June, 2001, 2003 and 2004 flows ranked 17th, 18th, and 23rd, respectively; whereas 2000 and 2002 flows ranked 62nd and 74th, respectively. For July, 2003, 2004 and 2001 flows ranked 7th, 10th, and 20th, respectively; whereas 2000 and 2002 ranked 49th and 63rd, respectively. For August, 2003 flow ranked 1st; whereas 2001, 2000, 2002 and 2004 flows ranked 31st, 49th, 50th and 59th, respectively. For September, 2001, 2003 and 2002 ranked 6th, 12th, and 18th, respectively; whereas 2000 and 2004 ranked 58th and 75th, respectively.

This means that the years 2001 and 2003 represent relatively dry years. 2000 and 2002 represent fairly wet years for June and July; but 2000 and 2004 represent wet years for August and September.

I recommend that the maximum stage statistics for 2000 be used to guide the planning as to the safety of construction and for setting the crest of the cofferdam. The 2000 monthly stage statistics represent stages associated with slightly above average mean monthly river discharges.



This means that a water elevation of less than $(914.2 + 8.2)$ 922.4 feet (NAXD88) be set for the beginning of construction and that the crest of the cofferdam be no lower than elevation $(914.2 + 7.6)$ 921.8 feet (NAVD88).

Table 1 Mean Monthly Stages (ft) of the South Fork of the Skykomish River at the 5th Street Bridge

Year and Month	Minimum	Mean	Maximum
2000 June	5.8	6.6	8.2
2001 June	4.7	5.2	6.0
2002 June	5.9	7.2	8.7
2003 June	4.4	5.4	6.8
2004 June	4.4	5.4	6.4
2000 July	4.2	4.9	6.0
2001 July	3.6	4.1	4.9
2002 July	4.2	5.5	6.7
2003 July	3.2	4.0	4.8
2004 July	3.4	4.0	4.7
2000 August	3.2	3.8	4.4
2001 August	3.2	3.5	3.9
2002 August	3.3	3.9	4.6
2003 August	2.9	3.3	3.6
2004 August	3.2	3.8	5.9
2000 September	2.9	3.7	7.6
2001 September	2.7	3.2	3.5
2002 September	2.9	3.4	3.9
2003 September	2.7	3.2	3.8
2004 September	3.5	4.6	7.0

Attachment A

**Skykomish River Mean Monthly Discharges –
June through September, 1929-2004**

**Attachment A – Mean Montly Discharge (cfs) of the Skykomish River at Gold Bar
September Ordered Data**

USGS	12134500	9	1998	465	
USGS	12134500	9	1987	489	
USGS	12134500	9	1940	515	
USGS	12134500	9	1938	535	
USGS	12134500	9	1989	560	
USGS	12134500	9	2001	579	6
USGS	12134500	9	1929	594	
USGS	12134500	9	1993	597	
USGS	12134500	9	1942	612	
USGS	12134500	9	1957	635	
USGS	12134500	9	1952	646	
USGS	12134500	9	2003	651	12
USGS	12134500	9	1930	662	
USGS	12134500	9	1966	680	
USGS	12134500	9	1991	680	
USGS	12134500	9	1937	719	
USGS	12134500	9	1995	725	
USGS	12134500	9	2002	733	18
USGS	12134500	9	1990	739	
USGS	12134500	9	1967	769	
USGS	12134500	9	1943	773	
USGS	12134500	9	1946	806	
USGS	12134500	9	1939	830	
USGS	12134500	9	1979	855	
USGS	12134500	9	1986	886	
USGS	12134500	9	1935	917	
USGS	12134500	9	1936	926	
USGS	12134500	9	1994	927	
USGS	12134500	9	1934	976	
USGS	12134500	9	1951	1015	
USGS	12134500	9	1963	1056	
USGS	12134500	9	1960	1064	
USGS	12134500	9	1973	1073	
USGS	12134500	9	1953	1121	
USGS	12134500	9	1961	1121	
USGS	12134500	9	1999	1129	
USGS	12134500	9	1932	1137	
USGS	12134500	9	1996	1145	
USGS	12134500	9	1955	1150	
USGS	12134500	9	1931	1153	
USGS	12134500	9	1947	1176	
USGS	12134500	9	1975	1193	
USGS	12134500	9	1981	1200	
USGS	12134500	9	1988	1223	
USGS	12134500	9	1958	1226	
USGS	12134500	9	1965	1252	
USGS	12134500	9	1984	1253	
USGS	12134500	9	1950	1274	
USGS	12134500	9	1985	1311	
USGS	12134500	9	1962	1333	
USGS	12134500	9	1974	1350	
USGS	12134500	9	1982	1439	
USGS	12134500	9	1971	1486	
USGS	12134500	9	1992	1506	
USGS	12134500	9	1976	1525	
USGS	12134500	9	1956	1586	
USGS	12134500	9	1949	1691	
USGS	12134500	9	2000	1703	58
USGS	12134500	9	1948	1765	
USGS	12134500	9	1970	1774	
USGS	12134500	9	1945	1777	
USGS	12134500	9	1977	1779	
USGS	12134500	9	1983	1784	
USGS	12134500	9	1969	1998	
USGS	12134500	9	1980	2004	
USGS	12134500	9	1944	2147	
USGS	12134500	9	1954	2220	
USGS	12134500	9	1964	2450	
USGS	12134500	9	1997	2522	
USGS	12134500	9	1941	2542	
USGS	12134500	9	1972	2881	
USGS	12134500	9	1968	2985	
USGS	12134500	9	1978	2995	
USGS	12134500	9	1933	3366	
USGS	12134500	9	2004	3537	75
USGS	12134500	9	1959	4942	

**Attachment A – Mean Montly Discharge (cfs) of the Skykomish River at Gold Bar
August Ordered Data**

USGS	12134500	8	2003	535	1
USGS	12134500	8	1992	589	
USGS	12134500	8	1941	612	
USGS	12134500	8	1987	627	
USGS	12134500	8	1958	654	
USGS	12134500	8	1940	659	
USGS	12134500	8	1994	662	
USGS	12134500	8	1938	690	
USGS	12134500	8	1944	696	
USGS	12134500	8	1986	707	
USGS	12134500	8	1931	712	
USGS	12134500	8	1998	717	
USGS	12134500	8	1930	722	
USGS	12134500	8	1934	754	
USGS	12134500	8	1985	827	
USGS	12134500	8	1951	843	
USGS	12134500	8	1945	849	
USGS	12134500	8	1970	855	
USGS	12134500	8	1988	858	
USGS	12134500	8	1981	862	
USGS	12134500	8	1979	879	
USGS	12134500	8	1973	886	
USGS	12134500	8	1936	888	
USGS	12134500	8	1961	891	
USGS	12134500	8	1942	918	
USGS	12134500	8	1969	947	
USGS	12134500	8	1929	983	
USGS	12134500	8	1963	986	
USGS	12134500	8	1952	991	
USGS	12134500	8	1957	1006	
USGS	12134500	8	2001	1006	31
USGS	12134500	8	1947	1039	
USGS	12134500	8	1989	1041	
USGS	12134500	8	1993	1086	
USGS	12134500	8	1996	1088	
USGS	12134500	8	1990	1132	
USGS	12134500	8	1937	1136	
USGS	12134500	8	1980	1142	
USGS	12134500	8	1967	1165	
USGS	12134500	8	1960	1215	
USGS	12134500	8	1935	1235	
USGS	12134500	8	1966	1236	
USGS	12134500	8	1984	1243	
USGS	12134500	8	1939	1260	
USGS	12134500	8	1983	1260	
USGS	12134500	8	1978	1282	
USGS	12134500	8	1991	1293	
USGS	12134500	8	1946	1310	
USGS	12134500	8	2000	1316	49
USGS	12134500	8	2002	1318	50
USGS	12134500	8	1977	1321	
USGS	12134500	8	1943	1346	
USGS	12134500	8	1995	1388	
USGS	12134500	8	1959	1422	
USGS	12134500	8	1968	1459	
USGS	12134500	8	1965	1470	
USGS	12134500	8	1982	1487	
USGS	12134500	8	1932	1518	
USGS	12134500	8	2004	1553	59
USGS	12134500	8	1953	1608	
USGS	12134500	8	1956	1620	
USGS	12134500	8	1997	1652	
USGS	12134500	8	1962	1810	
USGS	12134500	8	1948	1882	
USGS	12134500	8	1949	1971	
USGS	12134500	8	1975	2082	
USGS	12134500	8	1971	2615	
USGS	12134500	8	1972	2660	
USGS	12134500	8	1955	2741	
USGS	12134500	8	1950	2844	
USGS	12134500	8	1933	2989	
USGS	12134500	8	1976	3106	
USGS	12134500	8	1999	3126	
USGS	12134500	8	1954	3304	
USGS	12134500	8	1974	3389	
USGS	12134500	8	1964	3605	

**Attachment A – Mean Montly Discharge (cfs) of the Skykomish River at Gold Bar
July Ordered Data**

USGS	12134500	7	1941	971	
USGS	12134500	7	1940	990	
USGS	12134500	7	1992	1027	
USGS	12134500	7	1987	1267	
USGS	12134500	7	1977	1279	
USGS	12134500	7	1958	1291	
USGS	12134500	7	2003	1381	7
USGS	12134500	7	1944	1388	
USGS	12134500	7	1934	1391	
USGS	12134500	7	2004	1429	10
USGS	12134500	7	1931	1645	
USGS	12134500	7	1986	1719	
USGS	12134500	7	1930	1736	
USGS	12134500	7	1994	1779	
USGS	12134500	7	1963	1811	
USGS	12134500	7	1938	1848	
USGS	12134500	7	1995	1867	
USGS	12134500	7	1945	1896	
USGS	12134500	7	1993	1903	
USGS	12134500	7	2001	1937	20
USGS	12134500	7	1973	1949	
USGS	12134500	7	1998	2033	
USGS	12134500	7	1996	2106	
USGS	12134500	7	1957	2127	
USGS	12134500	7	1951	2132	
USGS	12134500	7	1981	2136	
USGS	12134500	7	1980	2162	
USGS	12134500	7	1970	2316	
USGS	12134500	7	1936	2339	
USGS	12134500	7	1969	2345	
USGS	12134500	7	1989	2394	
USGS	12134500	7	1978	2397	
USGS	12134500	7	1961	2431	
USGS	12134500	7	1985	2444	
USGS	12134500	7	1942	2511	
USGS	12134500	7	1960	2547	
USGS	12134500	7	1947	2567	
USGS	12134500	7	1979	2674	
USGS	12134500	7	1929	2725	
USGS	12134500	7	1968	2759	
USGS	12134500	7	1988	2794	
USGS	12134500	7	1952	2849	
USGS	12134500	7	1965	3140	
USGS	12134500	7	1937	3242	
USGS	12134500	7	1990	3281	
USGS	12134500	7	1935	3385	
USGS	12134500	7	1962	3405	
USGS	12134500	7	1948	3594	
USGS	12134500	7	2000	3703	49
USGS	12134500	7	1966	3711	
USGS	12134500	7	1967	3869	
USGS	12134500	7	1939	3948	
USGS	12134500	7	1991	4003	
USGS	12134500	7	1984	4072	
USGS	12134500	7	1983	4115	
USGS	12134500	7	1932	4293	
USGS	12134500	7	1946	4403	
USGS	12134500	7	1982	4618	
USGS	12134500	7	1949	4666	
USGS	12134500	7	1959	5034	
USGS	12134500	7	1943	5090	
USGS	12134500	7	1953	5090	
USGS	12134500	7	2002	5191	63
USGS	12134500	7	1975	5934	
USGS	12134500	7	1997	6243	
USGS	12134500	7	1956	6326	
USGS	12134500	7	1976	6415	
USGS	12134500	7	1955	7304	
USGS	12134500	7	1950	7671	
USGS	12134500	7	1999	7764	
USGS	12134500	7	1954	7841	
USGS	12134500	7	1933	8080	
USGS	12134500	7	1971	8199	
USGS	12134500	7	1972	8209	
USGS	12134500	7	1964	8364	
USGS	12134500	7	1974	8413	

**Attachment A – Mean Montly Discharge (cfs) of the Skykomish River at Gold Bar
June Ordered Data**

USGS	12134500	6	1992	1955	
USGS	12134500	6	1941	2169	
USGS	12134500	6	1940	2595	
USGS	12134500	6	1934	2600	
USGS	12134500	6	1987	3630	
USGS	12134500	6	1963	3689	
USGS	12134500	6	1994	3920	
USGS	12134500	6	1930	3941	
USGS	12134500	6	1944	4029	
USGS	12134500	6	1996	4029	
USGS	12134500	6	1995	4112	
USGS	12134500	6	1986	4115	
USGS	12134500	6	1977	4152	
USGS	12134500	6	1958	4237	
USGS	12134500	6	1993	4238	
USGS	12134500	6	1980	4300	
USGS	12134500	6	2001	4377	17
USGS	12134500	6	2003	4580	18
USGS	12134500	6	1973	4607	
USGS	12134500	6	1983	4630	
USGS	12134500	6	1931	4846	
USGS	12134500	6	1945	4903	
USGS	12134500	6	2004	4942	23
USGS	12134500	6	1938	5188	
USGS	12134500	6	1979	5351	
USGS	12134500	6	1952	5430	
USGS	12134500	6	1998	5433	
USGS	12134500	6	1951	5558	
USGS	12134500	6	1991	5578	
USGS	12134500	6	1988	5580	
USGS	12134500	6	1947	5617	
USGS	12134500	6	1957	5737	
USGS	12134500	6	1978	5760	
USGS	12134500	6	1981	5850	
USGS	12134500	6	1942	5931	
USGS	12134500	6	1953	6020	
USGS	12134500	6	1939	6089	
USGS	12134500	6	1965	6152	
USGS	12134500	6	1962	6252	
USGS	12134500	6	1989	6351	
USGS	12134500	6	1966	6452	
USGS	12134500	6	1960	6627	
USGS	12134500	6	1968	6721	
USGS	12134500	6	1935	6753	
USGS	12134500	6	1976	7141	
USGS	12134500	6	1990	7269	
USGS	12134500	6	1929	7329	
USGS	12134500	6	1943	7498	
USGS	12134500	6	1949	7549	
USGS	12134500	6	1970	7603	
USGS	12134500	6	1984	7683	
USGS	12134500	6	1961	7693	
USGS	12134500	6	1985	7759	
USGS	12134500	6	1936	7776	
USGS	12134500	6	1932	7984	
USGS	12134500	6	1954	8428	
USGS	12134500	6	1971	8491	
USGS	12134500	6	1969	8537	
USGS	12134500	6	1946	8551	
USGS	12134500	6	1975	8808	
USGS	12134500	6	1959	8835	
USGS	12134500	6	2000	9062	62
USGS	12134500	6	1982	9291	
USGS	12134500	6	1956	9534	
USGS	12134500	6	1937	9627	
USGS	12134500	6	1967	9655	
USGS	12134500	6	1997	9704	
USGS	12134500	6	1999	10240	
USGS	12134500	6	1955	10590	
USGS	12134500	6	1933	10960	
USGS	12134500	6	1972	11000	
USGS	12134500	6	1948	11060	
USGS	12134500	6	1964	11190	
USGS	12134500	6	2002	11350	74
USGS	12134500	6	1950	11900	
USGS	12134500	6	1974	13610	